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A NEW DIPLOPOD FROM THE GALAPAGOS ISLANDS WITH NOTES ON THE CHILOPODS.

By Ralph V. Chamberlin.

The type specimens of the interesting new diplopod here described were collected on Chatham Island in the Galapagos Archipelago in 1898 and 1899, presumably by R. E. Snodgrass as a member of the Stanford Expedition of 1898–1899.

Of the five species of chilopods known from the Galapagos Islands, specimens of all of which were secured by the expedition mentioned, four appear to be indigenous. The five species are as follows.

1. **Orphnaeus brevilabiatus** (Newport).

One female from Hood's Island (May 18, 1899), between which and specimens from Central America, the West Indies and elsewhere I fail to detect any essential differences. A very common geophiloid throughout the warmer parts of both hemispheres.

2. **Mecistocephalus parvus** Chamberlin.

I at first regarded the specimen of this species, which were from Clipperton Island (November 23, 1898), as belonging to *M. punctifrons* Newport; but a more critical study of material from India, the East Indies and different parts of warmer America has convinced me that Newport's species has been too broadly conceived by Haase and others and that several clearly distinct species have been confused under the name. The confusion has resulted largely because the species agree in having the number of pairs of legs constantly 49, and do not differ in various other characters that ordinarily serve for the discrimination of species in related families. The species dominant in Java and the Malay Peninsula is a different one from the typical *punctifrons* of India; and the species occurring in the Bermudas, West Indies and South and Central America is also different and must bear the name *guildingi* applied

by Newport to specimens from St. Vincent. The types of *M. parvus* are small slender specimens, near 20 mm. in length. The cephalic plate is proportionately broader than in the other species mentioned, being from 1.61 to 1.63 times longer than wide; whereas in *guildingi* it is from 1.98 to 2.1 times longer than wide, and in the Javan species (for which Meinert's name *cephalotes* must probably be resurrected) from 1.68 to 1.71 times longer, while careful micrometer measurements of numerous specimens of *punctifrons* from India showed the cephalic plate in adults to vary from 1.88 to 1.91 times longer than wide, the plate in partly grown specimens being near 1.85 and in the youngest ones 1.8 times longer than wide.

3. **Pectiniunguis albemarlensis** Chamberlin.

This species is very close to *P. americanus* which is apparently common on both the Pacific and eastern coasts of Mexico and has been taken on the Florida Keys. The Galapagos species has near the same number of legs (61 pairs) as *americanus* and is also marked with a similar geminate dark stripe along the dorsum. The head is distinctly broader, the ratio of length to breadth in the type being 57: 52, while the basal plate is longer, being but 2.5 times wider than long as against 3 times in *americanus*. The ventral pores are more numerous and the area occupied on each sternite materially greater. Of the two other known species of Pectiniunguis as now restricted, one is from Cuba and the other from Colombia. In California occur several species of a related genus which I have recently named *Nyctunguis*. One female of *P. albemarlensis* was secured on Albemarle Island at Iguana Cove (December, 1898).

4. **Cryptops navigans** Chamberlin.

Two specimens taken on Clipperton Island November 23, 1898.

5. **Scolopendra galapagoensis** Bollman.

Specimens of this species were taken on Hood, Chatham, Bindloe, Narborough and Albemarle Islands. It seems to be much the commonest chilopod of the Archipelago, being the only one in fact that was taken on more than one island. Its affinities seem to be closest to the group of the division Collares occurring in the warmer parts of America.

The new diplopod *Nesodesmus* is a member of the Pyrgodesmidæ.

Nesodesmus gen. nov.

Head strongly granulo-tuberculate. Antennæ short, clavate, with the fifth article thickest and much the longest.

Dorsum strongly elevated and convex; strongly sculptured, being densely granular and tuberculate over the entire surface of keels as well as remaining portion of metazonites; a longitudinal row of larger tubercles each side of the median line, the tubercles increasing in size caudad with a tendency to be confluent. Spiracles on segments 5, 7, 9, 10, 12, 13, 15 and 16, each opening through a thick, subcylindrical papilla borne on the marginal lobe second from the caudal corner. Keels large, depressed, covering the legs from above, almost contiguous, laterally mostly deeply lobate, the lobes either 3, or by subdivision of the anterior one, 4 in number, the caudal border of keel also deeply lobate and the anterior one of most less strongly lobed.

First dorsal plate broadly extended and covering the head as in *Lophodesmus*. Typically showing 12 rounded teeth or crenations along the anterior margin corresponding to the twelve lobules marked off on the border by 11 radial sulci.

Anal tergite short and broad, its caudal margin convex in general outline; a broader median portion notched at the middle on each side of which are two sharply separated narrow lobes or teeth. In the type species the keels of the nineteenth tergite are produced caudad a little beyond the caudal margin of the anal plate.

Genotype: *N. insulanus* sp. nov.

This genus is apparently most closely allied with *Lophodesmus* as represented in Central America and Mexico. It is separated chiefly because of the difference in the position of the spiracle and the form of its papilla on the carinal margin, this occurring near the middle of the side instead of at the caudolateral corner; in the deeper lobation of the lateral border and the larger number of its divisions and in the lobation of the anterior as well as of the caudal border; and in having the entire dorsal surface of the keels as well as of the median portion of the metazonite strongly tuberculate. The first tergite has its anterior border divided into 12 lobules instead of the 10 characteristic of species of Lophodesmus thus far known.

Nesodermus insulanus sp. nov.

Dark brown, irregularly dusky. Vertex of the head like the dorsum, but the remaining portions together with the antennæ and legs a paler brown or brownish yellow. Prozonites ventrally yellow.

Vertex and upper frontal region of head tuberculate with corresponding dusky or black areolation. Other parts with corresponding areolæ limited by a network of impressed lines.

Antennæ short, strongly clavately thickened distad, the fifth article being much the longest and thickest; sixth article next in thickness and length, with the seventh more slender and much shorter. Hairs on distal articles subdense, all very short.

First dorsal plate with its border projecting horizontally anteriorly and laterally widely beyond the head. Much longer than the other tergites. Caudal margin mesally straight. Border divided by radial sulci into 12 lobules each of which projects as a wide, low, rounded tooth or crenulation at the margin. Lobules finely granular, the convex median portion of the plate appearing more coarsely and densely tuberculate.

Sides of body parallel or nearly so excepting towards ends. Keels of dorsal plates large, extending laterally over the feet. Keels of the second tergite bent conspicuously cephalad, those of the next three less and less so and the remaining ones back to the eighteenth with anterior and caudal margins nearly straight and parallel and at right angles to the long axis of the body. Keels of the eighteenth segment bent caudad. Keels increasing in length (*i. e.*, in longitudinal diameter) from the third caudad, those of the second being longer than those of the third. Each keel of the second plate with lateral margin showing 3 rounded teeth with corresponding divisions of border separated by sulci; the third and fourth plates with borders of keels similar but teeth better separated. On keels of the fifth tergite the lateral incisions of keels extend mesad along sulci much farther, dividing the border into 3 narrow, distally rounded lobes from the median of which projects the pale subcylindrical spiraculiferous papilla; in all succeeding plates the anterior lobe is subdivided thus giving 4 distinct lobes separated by deep narrow incisions replacing the sulci of the most anterior plates; the most anterior lobe extending farthest ectad, the posterior one least. Caudal edge of keel of all plates

showing 2 (or 3) smaller lobes and the anterior margin presenting a corresponding number of still smaller lobes or teeth excepting on the second and third plates, the lobes or teeth becoming larger caudad. Spiraculiferous papillæ smooth, the dorsal surface of the rest of the keels and of the remaining portion of metazonites densely and strongly coarsely granular and tuberculate. Caudal margin of metazonites between keels presenting 9 or 10 distinct rounded teeth or crenulations which are weak or in part obliterated on the plates cephalad of the sixth. Two longitudinal rows of large tubercles, there being in each row 3 tubercles on each metazonite, the most caudal of these being on a lobe or tooth of the caudal margin; tubercles increasing in size from segment to segment in in going caudad, the caudal ones of the eighteenth and nineteenth segments in particular being large and conical. Keels of the nineteenth segment produced caudad so that the posterior edge is parallel with long axis of body or nearly so; between these keels 4 stout conical teeth project caudad and nearly attain level of caudal margin of the anal tergite when viewed from above.

Anal tergite short, nearly concealed from above by the nineteenth plate. Presenting a broad, mesally notched, median lobe and on each side of this and farther proximad 2 conical teeth separated by deep incisions.

Anal scale small; on its caudal margin presenting 2 conspicuous tubercles, each of which bears a long bristle.

Sternites very narrow; longitudinally sulcate.

Trochanters of the legs relatively very long.

Ducts of testes opening through simple perforations on the ventral surface of swellings on the coxæ of the second legs, these swellings commonly contiguous at the median line.

Gonopods of male each presenting a mesally hollow subhemispherical basal division apparently capable of being closed against the corresponding lobe of the opposite gonopod. Distal division short and proportionately broad; distally presenting a short process projecting caudad and a larger subfalciform anterior process from the caudal concave surface of which bends caudad the conically pointed tip of a third process which seems to be the stylus.

Length: 9.5 to 11.5 mm.; width 2 to 2.25 mm. *Locality:* Galapagos Archipelago; Chatham Island (May 21, 1899). Probably collected by Snodgrass.) Thirteen specimens were secured.

A NEW TRICHODECTES FROM BAJA CALIFORNIA.

By V. L. Kellogg and S. Nakayama,
Stanford University, Cal.

Among some old specimens of Mallophaga in the Stanford University collection we have found a male and a female of an interesting new species of Trichodectes, which is described herewith. The specimens were collected by the well-known ornithologist, R. C. McGregor, in a bird-collecting expedition to the islands off Baja California (San Martin, Cerros, Todos Santos, San Geronimo, Guadaloupe, and others). No parasites of mammals were, as far as the records show, obtained, and the specimens referred to in this paper were credited to bird hosts, the male to a *Corvus semicinctus* from Cerros Island and the female to *Hæmatopus frazari* from San Martin Island. There is undoubtedly error in these attributions, either in the record-keeping or by abnormal straggling in game bag or on skinning table from some mammal to these birds. The host is, therefore, unknown. The specimens are typical *Trichodectes* (mammal-infesting parasites), and certainly of the same species.

The new species suggests, in general shape of head, length and character of antennæ, the semi-dentate lateral margin of abdomen, and terminal segments of the male, the wide-spread and familiar *Trichodectes limbatus* of the goat; but the specific differences are marked. Especially is the new species distinguished by the shape of the abdomen, and great length of the tarsal claws. The abdomen of the male, in the new species, is as broad as long, almost roughly circular in outline, indeed, while in *limbatus*, it is elongate ovate. Also the posterior margin of the second abdominal segment bends conspicuously forward at its middle, revealing thus a broad but deep rounding posterior emargination in this segment. Thus the abdominal characters alone conspicuously distinguish this new species from any other known Trichodectes.

Trichodectes painei sp. nov. (fig. 1, A–D).

Male: Body, length 1.21 mm.; width (across third abdominal segment), .60 mm.; general color, pale yellowish brown with darker bands and markings on head and thorax, and pronounced, although narrow, dark lateral margins of abdomen,

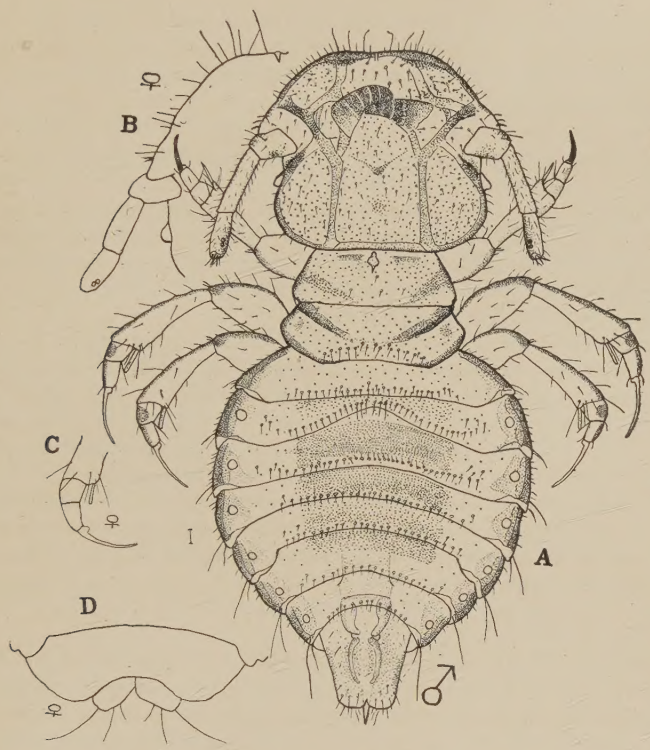

Fig. 1. *Trichodectes painei* sp. nov.

and distinct broad transverse bands, not reaching lateral margins, on segments 3 to 6, inclusive, of the abdomen.

Head, length .37 mm.; width .46 mm.; thus being wider than long; general shape quadrangular with rounding angles; clypeal front broad and straight with a slight gradual median concavity and at the middle of the concavity a very narrow, straight incision bisecting the anterior marginal marking; trabeculæ inconspicuous; ocular fossæ slight, with eyes unusually projecting and conspicuous; posterior margin straight. Antennæ very long, when projecting backwards extending slightly beyond posterior margin, second segment almost twice as long as third, two small sense pits on third segment. A pair of straight, nearly parallel occipital bands running forward to meet diagonal antennal bands, each occipital band also sending an inner branch to the base of the mandibles.

Prothorax slightly narrower than the metathorax with both segments of about the same length; lateral margins of prothorax slightly diverging so that the segment is widest between its posterior lateral angles. Metathorax widest in the middle with a projecting obtuse angle at the middle of each lateral margin; from these

obtuse angles the posterior margin runs back and inward in a flatly curving line for about one third of the width of the segment, the middle third of the posterior being straight, with a shallow concavity. A series of fine but distinct short hairs in a series roughly parallel with the slightly concave but nearly straight third of the posterior margin of the metathorax. Straight diagonal bands of darker color showing through each thoracic segment from the underside. Legs conspicuously long, largely because of the unusual length of tibiæ, tarsi and claws; tibiæ growing wider toward tip and bearing a short, strong, blunt, spineless projection at the inner angle of the tip; tarsi of middle and hind legs with claws of unusual length, each claw being longer than both tarsal segments together and more than half as long as the tibia; claws of the forelegs but a little more than half as long as those of middle and hind legs, but more strongly chitinized.

Abdomen, length .64 mm., width .60 mm.; almost roughly circular in outline, although really broader in front than behind, and with the projecting, tapering last segment and genitalia destroying the circular outline. Second segment with deeply but broadly emarginate posterior border. Lateral margins almost dentate because of the projecting postero-lateral angles of each segment. Each segment bearing a series of many fine short hairs along the median two thirds of the posterior margin; longer but inconspicuous hairs projecting from the postero-lateral angles of the segments. Strongly colored, but narrow, lateral borders on all segments; and conspicuous dark median transverse blotches covering most of the dorsum (for the middle half of its width) on segments three to six inclusive; last segment of abdomen narrow and projecting backward with the genitalia showing distinctly.

Female: Body, length 1.57 mm.; head .46 mm., width .56 mm.; length of abdomen .88, width .69 mm., the abdomen thus being considerably longer than broad, and hence not of the nearly circular shape of that of the male. The antennæ are not as long and slender as those of the male, the second segment being only slightly longer than the third. The ground color of the body and markings both paler than in the male, but the markings and blotches about the same in arrangement and character.

The species name *painei* is given for Mr. J. H. Paine, an active American student of the Mallophaga.

SCIARA CONGREGATA SP. NOV. (DIPTERA).

By O. A. Johannsen,
Cornell University, Ithaca, New York.

The following description is based on specimens reared at Fayetteville, Arkansas, by Mr. George G. Becker, whose account of the habits of this insect appears in the present number of Psyche.

Sciara congregata sp. nov.

Male: Length 2 mm. Head black, palpi and antennæ fuscous, the antennæ rather short, about two thirds as long as the wing (measured from humeral cross vein), the intermediate joints not twice as long as wide. Mesonotum subshining blackish; scutellum, metanotum, and pleura subopaque, brownish black. Abdomen and hypopygium subopaque brownish black, the latter stout, with claspers resembling those of *Sciara jucunda*, though the apical setæ are rather stouter. Coxæ and legs brownish, the tarsi dark brown; legs relatively short and stout, hind tibia about as long as the petiole of the media of the wing; apical third of tibiæ slightly broadened; hind tarsus about 0.8 as long as the tibia, hind metatarsus slightly over 0.7 as long as the following four joints. Wings smoky hyaline, veins dark brown, the radius, the forks of the media and the apical part of the forks of the cubitus beset with setæ. R_1 ends two thirds as far proximad of the fork of the media as the tip of R_s is distad of this point; basal section of R_s very faint and indistinct, though the basal section of R is evidently noticeably longer than R_1; costa produced nearly 0.6 of the distance from the tip of R_s to M_1; R_s ends slightly proximad of M_2; petiole of media very inconspicuous; cubitus forks distad of the base of the petiole of the media. Halteres dark.

Female: Length 2.5 mm. Like the male in coloring and structure differing in having slightly shorter antennæ, these being less than half as long as the wing, with intermediate joints but little longer than wide; the basal section of R_s and the petiole of the media a little more distinct. The lamellæ of the ovipositor are only slightly longer than wide.

Type in my collection; paratypes in the collection of the Arkansas Agricultural Experiment Station. This species will find a place in the key given on page 118, Fungus Gnats of North America (Bull. Maine Agr. Exp. Station, No. 200), between *S. vicina* and *S. dives*, differing from both in coloring, venation, and structure of hypopygium.

MIGRATING LARVÆ OF *SCIARA CONGREGATA* JOHANNSEN.

By George G. Becker,
Agricultural Experiment Station, Fayetteville, Arkansas.

The species of Sciara which Prof. Johannsen describes in this issue of Psyche, first came under my observation on July 6, 1912, when I noticed an army of the larvæ in a chain about five feet long and three inches wide at its greatest width. The chain of larvæ was widest at about the middle and tapered toward each end.

The general appearance of the army was that of a dead snake and I was about to pass by it when closer observation showed that it consisted of a migrating mass of larvæ. The chain was moving very slowly at a rate of probably not more than a few inches per minute.

In general the movement of the army suggested a sort of flowing motion in which the larvæ from the rear came up and traveled over their fellows in front of them. It was noticed that the larvæ on the top made much better progress than those below. This would naturally be the case since the individuals on the top depended upon those beneath them for purchase. Since the larvæ must have been piled up about eight deep in the middle of the procession it would seem that those next to the ground would be unable to make much progress, and that they would therefore have to wait until those to the rear had passed over them before they could gain any headway. It was thus noticed that the advance of the chain was made by the larvæ from above. These larvæ, naturally, made more rapid progress than those beneath them, and they no sooner gained the ground in front of the chain than they were followed and covered by the great mass of migrating larvæ coming from behind. Probably they did not emerge again until most of the chain had passed over them.

The locomotion of the individual larva was accomplished by a series of intermittent, jerky, flowing movements by which the larva glided over those beneath it. These migrating larvæ left a sort of trail in their wake somewhat similar to the track passed over by a snake.

A number of the migrating larvæ taken into the insectary and placed in a cage, containing some oak leaf mold into which they soon dispersed and fed rather actively for several days. About three days later on lifting layers of the mold, I noticed that most of the larvæ had transformed to delicate yellow pupæ. No accurate record was made of the time passed in the pupal stage but this was probably about two weeks.

On July 16, 1913, a little over a year after the first observation, a second army of the worms was noticed. This was also found in the town of Fayetteville, only a few hundred yards from the locality where the observation of the previous year was made. The army was much smaller than the one noticed last year (1912), probably not more than three feet long.

Some of these larvæ were kept and pupated about one week after they were transferred to the leaf mold. The adults emerged probably two to three weeks later, during my absence. This insect proved to be the same one observed last year. Specimens sent to Prof. O. A. Johannsen were determined by him as a new species. They are described in the present issue of PSYCHE under the name of *Sciara congregata.*

NATURAL ENEMIES OF SIMULIUM: NOTES.

By F. M. WEBSTER,
Bureau of Entomology.

In the concluding paragraphs of his paper on "American Black Flies or Buffalo Gnats," Bulletin 26, Technical Series Bureau of Entomology, April, 1914, the author, Mr. J. R. Malloch, calls attention to the occurrence of parasites of the larvæ found in Illinois, and also found by Mr. E. H. Strickland near Boston, Mass.

In the last paragraph of his paper, Mr. Malloch refers to some work done by agents of the Bureau of Entomology many years ago. As this reference leaves the matter somewhat obscure, it may be stated that on May 6, 1888, while studying Simulium in the St. Francis River, near Madison, Ark., the writer found a Simulium larva about one-fourth grown, presumably belonging to what was then known as *Simulium pecuarum*, infested by some

species of Nematode worm which had every appearance of being an internal parasite.

Under the same date it was mailed to Division of Entomology, where it was duly received and given a division number 3498°. Doubtless the specimen has long ago disappeared, but it is this to which Mr. Malloch refers in his paper and may perhaps belong to the same species as was later found infesting larvæ of Simulium in the Sangamon and Illinois Rivers, and which Mr. Strickland years after has been able to carefully study.

On May 11, 1887, the writer while engaged in studying buffalo gnats and other species of Simulium in the St. Francis River at Madison, Ark., encountered a species of fly which were locally termed "black gnats." These acted very much like true buffalo gnats, although I was not able to observe them biting animals. Specimens were mailed to the Department of Agriculture and the notes of the Division of Entomology show that they were received May 14, 1887, and given the division number 4133. They were described as agreeing closely with the genus *Hilara* but differing by having mouth organs longer than the head, and by possessing a stigma-like black spot near margin of wings. A year later, or to be exact, May 6, 1888, the writer was again in the same locality engaged in the further investigation of Simulium and again encountered these flies in abundance. It would seem that, as they belong to a group known to be predaceous, they were presumably attacking the gnats, although I do not find that this was actually observed by me.

While camping on Devil's River, about fifty miles from the point where it empties in the Rio Grande, March 20 to 25, 1891, larvæ, pupæ and adults of a species of Simulium not recognizable as belonging to either *S. pecuarum* or *S. meridionale* were found in abundance. Specimens of all stages were forwarded to Washington where they appear to have been received May 9, and given the division number 5003. One of these adults, captured while in the act of attacking a horse, was infested by larvæ of a water mite, division number 5003°. This is the larva of a Hydrachnid agreeing with Limnesia.

A precisely similar observation was made by myself July 30, 1884, at Oxford, Ind., where an adult mosquito was discovered with one of the water mites attached thereto.

With reference to the discussion of *Simulium pecuarum* Riley, pp. 21–24 of Mr. Malloch's paper, and the note attached thereto, it may be stated that both males and oviparous females occurred in abundance and were sent to Washington from Somerset Landing, La., during April, 1886, and also the spring of both 1887 and 1888. As a matter of fact, the egg-laying female and the male do not usually travel far from the localities where the species breeds, the males apparently never following the biting, sterile females. The oviparous females were found to each contain 500 to 750 eggs. Oviposition was observed March 27, 1888, and hatching was witnessed the following day.

The specimen, to which Mr. Malloch refers as having been collected at College Station, Texas, was obtained in sweeping a field of wheat on the college farm, February 24, 1891, while the following day both larvæ and pupæ were found clinging to driftwood in the Brazos River, seven miles away.

An abundance of material was sent from both Somerset Landing, La., and Madison, Ark., during the years 1886 to 1891. While pupæ will not develop adults if kept in stagnant water, nevertheless eggs of this species hatched en route between these points and Washington, and pupæ, packed in Spanish moss in cigar boxes, frequently develop adults also en route.

Both this species and *S. invenustum* were observed attacking stock in the White Rock Mountains near Vineland, Ark., February of the same year. Specimens were sent to Washington, and received the division number 4094B. The other sendings to which this note refers were from Pecos Creek above Marble Falls, Texas, March 7, and Cypress Mill a few days later. Other material, belonging to *S. venustum*, was sent to the Department March 19 and 23, 1887, when the females were observed ovipositing at Somerset Landing, La.

S. meridionale was sent frequently during the years 1886 to 1891 from both Somerset Landing, and from Madison, Ark., the latter collected in the St. Francis River. Simulium were also collected and forwarded to the Department from Elk Horn Falls on White River, just below Richmond, Ind., May 14, 1892. Also, specimens of two species from the Wabash River, near New Harmony, Posey County, Ind. A number of head of stock were killed

in that vicinity in 1884, and they were again quite troublesome in 1890.

In the case of sendings from Wooster, Ohio, some years after these dates, a farmer complained of flies getting in the ears and nostrils of his horses while being worked in a particular field near a brook, originating from a spring, and running over a rocky bed. Specimens of the adults were submitted and determined as *S. pecuarum* Riley, but I find no record of this in the Bureau notes on Simulium. If I remember correctly in this Wooster, Ohio, case, the difficulty was eliminated by pouring crude petroleum into the spring, allowing it to be carried down stream by the running water.

Prior to the outbreak of the war, the levees of the Mississippi River were continuous through the alluvial country and kept in good repair. With the outbreak of the war, however, when sterner matters overshadowed everything else, the levees were neglected, and in many cases caved into the river.

Soon after this time, as cavalry and artillery officers of both armies have since assured me, there were severe losses of both horses and mules in their respective commands. From this time onward to 1886, the buffalo gnat became such a scourge, killing in many cases every horse and mule on a plantation, that their appearance came to be greatly dreaded.

It is the remembrance of those days when both domestic animals and occasionally a human fell a prey to these flies, that remains to be refreshed in the minds of the people even to this day, whenever the levees give way and overflows occur during the spring time. There is, however, practically no danger whatever from a return of such disastrous outbreaks of buffalo gnats as formerly occurred. The gnats do not breed in the Mississippi River itself, and it will require more than one season's overflow to enable them to increase in numbers sufficient to become a menace to domestic animals.

The writer has been bitten by these gnats until his face and neck were so blotched as to render shaving impossible for weeks. Civil engineers working on the St. Francis River, during excessive abundance of buffalo gnats, suffered severely from their attacks. The gnats would make their way down their necks and under their clothing, and also down their rubber boots and collect there about

the angles. I have seen such men months afterwards with the calves of the legs and the ankles discolored as though the limb had been beaten or severely bruised. It may be stated in this connection that pellagra was not at that time recognized in this country.

THE MECHANISM OF THE MOUTH PARTS OF THE SQUASH BUG, *ANASA TRISTIS* DEGEER.[1]

By Daniel G. Tower, B.S.,

In preparing a previous paper dealing with the external anatomy of the squash bug (Tower, '13) it was found necessary to work out the structure of the mouth parts and internal anatomy of the head region. The mouth parts proved to be so interesting that a study more detailed than was possible in a general consideration of the anatomy has been made, the results being incorporated in the present paper. A brief description of the external region of the head and its parts has also been included so that one may more readily orient himself as to the relation of the parts to one another.

At this point I wish to thank Dr. H. T. Fernald for his assistance and the loan of books and pamphlets from his private library; and Dr. G. C. Crampton, who has directed my work and greatly assisted me in preparing this paper for publication.

As the sclerites of the head capsule are solidly fused together the general regions are all that can be described. Of these the occiput (occ), see Pl. 1 f. 1, lies behind the ocelli (oc) and forms the posterior portion of the head surrounding the occipital foramen. It is marked off by a shallow transverse groove, from the vertex. The vertex or cranium (v) comprises the dorsal region in front of the occiput and bears the ocelli. This area is not marked off from the frons (f), which lies above and between the bases of the antennæ. The anterior margin of the frons is united with the base of the clypeus (c).

Below and on either side of the compound eyes (e) lie the genæ (g), while the ventral posterior portion of the head capsule forms

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[1] Contribution from the Entomological Laboratory, Massachusetts Agricultural College.

the gula (gu). The clypeus, as has been stated, is fused at its base with the frons, and at this point is narrow, but as it curves forward and downward it widens at its tip to form the base of attachment for the labrum (lbr) from which it is separated by a narrow membranous ring.

The labrum is an elongate triangular sclerite. Its anterior surface is convex, while its posterior surface is flat and contains a groove which lies above the groove on the basal half of the anterior surface of the labium (lab).

On either side of the clypeus is a narrow prolongation of the frons called the fulcrum (fr). The fulcra lie close to the lateral walls of the clypeus hiding them, but not united with them except at their bases, where they fuse with the head capsule.

The maxillary laminæ (lm) lie below the base of the antennæ (ant). Their bases are fused with the genæ and their ventral margins are united with the bucculæ (bu), which are chitinous plates projecting from the anterior ventral side of the head on either side of the base of the labium.

The labium articulates with the anterior ventral region of the head between the bucculæ. The labium contains, as stated above, a dorsal groove in which lie the setæ (s). The edges of the groove beyond, or distal to the overlying labrum, overlap, forming a closed tube, thus giving the enclosed setæ more support. At its basal end the groove becomes very shallow; the labium becomes filled with muscles, tracheæ and nerves, and the setæ in this portion of the labium gradually come to lie within the labrum, whose edges meet beneath and confine the setæ.

The setæ now pass back through the articulating membranes, which lies between the labrum and clypeus and between the lateral walls of the clypeus. The walls of the clypeus at its tip turn under, and their edges interlock, forming a narrow pair of supporting lobes above which the setæ pass. Upon emerging from these lobes the maxillary setæ (m) spread apart to receive the tip of the pharynx and the canal from the salivary pump, both of which enter the setæ at this point.

The setæ represent the mandibles (md) and the maxillæ (m). The maxillæ are fluted and interlocked so as to form two tubes, namely the upper or suction canal (fc), and the lower or salivary canal (sc), see Pl. 1 f. 2. The mandibles are slightly shorter than

the maxillæ and their tips are barbed. Their function is that of piercing the plant tissues and holding the setæ in place, while the tips of the maxillæ, which are acute and fluted, probe the plant tissues, take up the plant juices and eject the saliva.

At the point where the maxillary setæ diverge they are surrounded by a membranous sheath, which renders air tight their connections with the pharynx (ph) and with the salivary pump canal or efferent canal (ec). After separating, the maxillæ together with the mandibles pass back, one of each on either side of the pharynx. The above mentioned membranous sheath also extends back on either side of the pharynx and encloses the setæ, being fastened to their bases. Soon after the maxillary and mandibular setæ have separated, at their junction with the pharynx, the mandibles separate from the maxillæ and take up a position above them.

The bases of both the maxillæ and mandibles widen posteriorly, forming attachments for the muscles which operate them, especially the inner dorsal portion of the base of the maxillæ. This becomes thickened to form a prominent ridge to which the chitinous rod (h), see Pl. 1 f. 7 and Pl. 2 f. 9, which articulates with the genæ, is fastened by a short tendon. The rod runs downward between the setæ and the side of the pharynx, turning under the setæ, and here lies above the tentorial lobes, being embedded in a membrane which separates the muscles of the setæ from these lobes. Laterally the end of this crescent shaped rod is fastened to the under side of a small internal knob on the genæ (p) situated directly below the compound eye. Ventrally the rod is attached to the tentorial lobe, see Pl. 1 f. 7.

The maxillary setæ are each controlled by two powerful muscles, both of which are attached directly to the bases of the maxillæ. These are the protractor muscle (pm_1), which extends anteriorly and is attached to the inside of the maxillary lamina and the side of the tentorial structure supporting the pharynx and salivary pump; and the retractor muscle which extends posteriorly and is attached to the occiput and also by a few fibres to the dorsal surface of the tentorial lobe.

Each mandibular seta is controlled by two series of muscles. The two retractor muscles (rm), see Pl. 1 f. 3, are attached directly

to the base of the seta. A short upwardly directed one is attached behind the ocelli, a longer one extends posteriorly and is attached laterally to the walls of the occipital foramen. The protractor muscle (pm) is attached to the inside of the frons. This muscle instead of being directly attached to the base of the mandible, is attached to a small chitinous triangular plate (b) which articulates at one corner with the gena near the anterior margin of the latter just anterior to the base of the antenna. This triangular plate likewise articulates with the mandible by means of a small rod (a) which is attached at its posterior end to the base of the mandible, while its anterior end articulates with the ventral corner of the triangular plate. The muscle in contracting pulls the mandible forward by means of the small connecting rod. These protractor and retractor muscles control the piercing and probing of the maxillary setæ, and the piercing and holding of the plant tissues by the mandible.

The cavity of the pharynx (ph), which is larger in the middle than at either end, becomes continuous with that of the suction canal, in the setæ, at the point of divergence of the maxillary setæ. At this point the hypopharynx (hph), see Pl. 2 f. 12, or anterior portion of the ventral plate of the pharynx (which is a slender chitinous trough-shaped process) enters the suction canal and lies on the ventral floor of the latter, while the epipharynx, or anterior portion of the dorsal plate of the pharynx, lies above the setæ, fitting snugly over them, and extends anteriorly between the lobes of the clypeus. The membranous sheath surrounding the union of the pharynx and setæ make this union air tight.

The pharynx becomes constricted posteriorly as it passes between the circumœsophageal commissures, opening posteriorly into a membranous œsophagus. Posterior to this constriction the œsophagus is enclosed by a sheath made up of longitudinal muscles. This sheath is connected with the wall of the occipital foramen dorsally by two transversely attached muscles, given off dorsolaterally from the muscular sheath, and ventually it is connected by two ventro-lateral muscles which diverge and are attached to the walls of the occipital foramen. This sheath extends from the posterior end of the pharynx back into the prothoracic region. The four muscles support the œsophagus in this region and probably by their movements of relaxing and contracting, together

with the action of the longitudinal muscles of the sheath, play some part in passing the food down the œsophagus.

The pharynx is double U-shape in cross section. The lateral margins of the dorsal plate (dp) are attached to the dorsal edges of the rigid chitinous ventral plate. To the dorsal surface of the dorsal plate are attached the powerful pharyngeal muscles (phm), see Pl. 1 f. 6, which retracting draw up the dorsal plate creating a vacuum thereby drawing the plant juices up through the suction tube of the setæ and into the pharynx.

The pharyngeal muscles are attached dorsally to the inside of the head capsule. There are three distinct series of pharyngeal muscles attached to the dorsal plate of the pharynx. The first or anterior series is short and composed of small muscles. They are attached to the dorsal plate just posterior to the epipharynx. The second is the longest series and is attached to the widened middle portion of the pharynx. The third or posterior series is attached to the more flattened upcurved posterior portion of the pharynx.

As the dorsal plate lies on the ventral plate, when the pharyngeal muscles are relaxed it seems reasonable to suppose that this pump acts in the following manner. The middle portion of the pharynx is filled when muscle series one contracts and is followed by the contraction of series two, the third series remaining relaxed while the middle portion of the pharynx is filling. When the middle portion is full the first series of muscles relaxes, allowing the dorsal plate to drop. The third series now contracts, opening the way into the œsophagus as the second series relaxes forcing the contents of the pharynx down into the œsophagus. Series three now relaxes to complete the emptying of the pharynx. At the completion of this series of contractions and relaxations at the posterior end of the pharynx, no doubt a new series of similar contractions and relaxations begin again, or possibly they start just before the completion of the first series. As the above description describes a wave-like motion and as no distinct valves have been found as are seen in the salivary pump, the above described process is no doubt the correct one.

Anteriorly the hypopharynx is marked off from the remainder of the ventral plate of the pharynx by raised irregular thickenings situated at the base of the hypopharynx on its lateral walls. The epipharynx is similarly marked off from the remainder of the dorsal

plate by corresponding thickenings on the dorsal plate. The epipharynx is also well marked off from the remainder of the dorsal plate because at this point the flexible dorsal plate ends and the portion beyond or epipharynx lies above the union of the setæ and bears ten papillæ. These irregular thickenings on the lateral walls of the dorsal and ventral plate interlock on either side of the canal of the pharynx. Upon a superficial examination these interlocking thickenings appear to be valvular, but closer observation shows them to be lateral to the canal and that the canal is closed by the dorsal plate of the pharynx being pressed against the ventral plate. Situated on the ventral surface of the epipharynx and above the diverging setæ there is, as stated above, a series of ten minute transparent papillæ arranged in pairs. It has been stated by some writers that these papillæ or glands secrete an oily substance which lubricates the setæ, which at this point must necessarily move forward and backward and in close contact with the epipharynx and hypopharynx. Others state that these are taste organs. The balance of opinion seems to be in favor of the latter view, although this point has not been sufficiently investigated.

Just posterior to the epipharynx on the dorsal plate of the pharynx there are four pairs of glands arranged in a line, each opening into the pharyngeal cavity. The nature of the secretions which these glands empty into the pharynx is not known, but probably they are digestive fluids. Above this series of glands is attached the first series of pharyngeal muscles.

Anteriorly and dorsally the pharynx is supported by two struts (n), see Pl. 2 f. 11 and 13, situated lateral to the lateral dorsal portion of the pharynx. These struts diverge and extending upward fuse with the lateral walls of the clypeus. In addition to these the anterior portion of the ventral plate is supported by upward extending diverging lateral struts which fuse with the inner walls of the fulcra, see Pl. 2 f. 12. At the point where the setæ meet, the lateral walls of the clypeus pass down on either side of the epipharynx and setæ and meet beneath the setæ, thus forming the lobes of the clypeus (lc), see Pl. 2 f. 13. The pharynx is also supported by the tentorial structures, but this will be taken up later.

Below the anterior end of the pharynx lies the salivary pump (sp) supported by the tentorium. This very unique pump consists of a chitinous cylinder and piston. The cylinder is closed at

its anterior end except for the two openings of the salivary ducts (sd) on its ventral side and the opening into the salivary pump canal or efferent canal (ec) in its anterior dorsal surface. Within the cylinder is a valvular flap (iv) which is attached posterior to the salivary ducts. This valve covers these ducts and allows the salivary juices to enter the cylinder from the salivary ducts, but does not permit it to flow back. The dorsal opening is closed by a long valvular flap (ov), attached to the dorsal wall of the efferent canal, which extends forward. This allows the salivary fluid to pass out of the pump and into the efferent canal, but not to return again into the cylinder. Normally the cylinder is nearly filled by the piston head or plunger (pl), see Pl. 1 f. 5, to which is attached anteriorly and laterally the elastic flexible membranous posterior wall of the cylinder. Posteriorly the piston head or plunger is attached to a piston rod to which are attached two large muscles (k) which diverge posteriorly and are attached to the posterior ventral region of the head and also by few muscle fibres to the ventral surface of the lobes of the tentorium. These muscles in contracting draw the plunger back creating a vacuum in the cylinder. This closes the dorsal outlet valve and opens the ventral or inlet valves causing the pump cylinder to fill with saliva from the salivary ducts. When the muscles relax, the elasticity of the posterior wall of the cylinder draws the plunger back into place, thereupon the ventral valves are closed and the dorsal one is opened and the saliva is forced out through the efferent canal and down the salivary canal in the setæ and into the plant tissues.

It seems not unreasonable to suppose that these salivary juices act on the plant cells chemically, possibly as a poison, and cause them to yield their juices more readily, although this point has not yet been investigated.

The efferent canal after leaving the pump cylinder extends forward in a straight line (being supported by a portion of the chitinous tentorium and gradually itself becoming chitinized) until it reaches the membranous sheath about the setæ which it penetrates, and then unites with the lower of salivary canal in the setæ.

The tip of the efferent canal which is trough-like and chitinized enters the salivary canal at the separation of the maxillary setæ and lies on the ventral surface of the salivary canal. The union is made air tight by the chitinous tentorial support of the efferent canal and the membranous sheath.

As these unions of the pharynx and the efferent canal with the setæ must be more or less loose to allow for the forward and backward sliding movements of the setæ, as they are used in feeding, the membranous sheath must fit tightly in and about these parts to insure that there be no leakage at these two joints.

The tentorial structures are variously modified. The middle region of the ventral plate of the pharynx is supported by two chitinous plates which abut against and are attached to the posterior portion of the head in the gula region. These pass forward and upward as broad curved narrowing plates. They converge as they approach the pharynx and their inner edges turn up so that the ventral surfaces of the turned up portion lie along the sides of the ventral plate and are united by tendons to the ventral plate of the pharynx, see Pl. 1 f. 4 and 7. These plates continue forward along the sides of the pharynx, their ventral surfaces extend further up the side of the pharynx. In cross section they appear somewhat crescent shaped as seen in Pl. 1 f. 6 (t). Lying on either side of the pharynx, they form a trough or bed in which the pharynx lies. Anteriorly the salivary pump lies below the pharynx and between these curved tentorial structures securely held in place by the connective tissue which surrounds it. Just anterior to the pump, portions of the two inner surfaces of the plates pass upward on either side of the efferent canal supporting it and continue with it to its connection with the setæ. A portion of each plate passes forward and slightly downward, fusing medianly, with that of the other side, below the portions which support the efferent canal to form the plate to which is attached the dorsal anterior surface of the labium.

Opposite the anterior end of the salivary pump, the outer margins of the plates roll upward and over the fused central plates, and form the two black heavily chitinized horns of the tentorium (ht), each of which contains a groove, which acts as a guide to the converging setæ, which meet over the tip of these horns and pass forward together above the lobes of the clypeus.

The horns of the tentorium separate posteriorly to allow the chitinized tip of the efferent canal and its supporting structures to pass upward between them and connect with the salivary canal in the maxillary setæ at the point where the setæ come together.

The lateral margins of the horns of the tentorium and the lateral margins of the plate to which the anterior dorsal surface of the

labium is attached, are fused to the inside of the maxillary lamina and to the bucculæ along the line of union of the lamina with the bucculæ.

A very delicate chitinous rod (i) which broadens dorsally is situated internal to each compound eye. Each of these rods is attached to the dorsal surface of the same small knob-like projections of the genæ below the compound eyes, to which the chitinous rod that articulates with the base of the maxillary setæ is attached, see Pl. 1 f. 7 (p), and extending upward and slightly forward is attached just above the eye. These rods apparently act as protectors and supports of the eye structures and a few muscle fibres from the antennæ are attached to them dorsally.

There are two thick strong struts projecting inward from the head capsule, one on either side of the head, located slightly anterior to and inward from each ocellus. These form the base of attachment for most of the antennal muscles.

The labrum is a very flexible sclerite. It contains numerous muscles, tracheæ and nerves. The action of its muscular system has not been worked out.

The labium is controlled by two muscles, of these the protractor, or extensor, extends down the labium beneath the anterior surface and is attached basally to a small process of the tip of the tentorial plate to which the labium is attached. The retractor muscle extends down the labium posteriorly and basally is fastened to the ventral surface of the plate with which the labium articulates.

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LETTERING OF FIGURES.

a = chitinous rod at base of mandible.
ant = antenna.
b = chitinous triangular plate articulating with genæ.
b-ant = base of antenna.
bu = bucculæ.
c = clypeus.
dp = dorsal plate.
e = eye.
ec = efferent canal.
f = frons.
fc = food canal or suction canal.
fr = fulcrum.
g = genæ.
gu = gula.
h = chitinous rod connecting maxillary setæ and genæ.
hc = head capule.
hph = hypopharynx.
ht = horns of the tentorium.
i = chitinous rod behind eye.
iv = inlet valve.
k = retractor muscle of salivary pump.
l = struts to which some of the antenna muscles fasten.
lab = labium.
lbr = labrum.
lc = lobes of the clypeus.
m = maxilla.
md = mandible.
ml = maxillary laminæ.
n = pharyngeal struts.
oc = ocelli.
occ = occiput.
ov = outlet valve.
p = internal knob below compound eye.
ph = pharynx.
phm = pharyngeal muscles.
pl = plunger of pump.
pm = protractor muscle of mandible.
pm_1 = protractor muscle of maxillæ.
pth = prothorax.
rm = retractor muscle.
s = setæ.
sc = salivary canal.
sd = salivary duct.
sg = salivary glands.
sp = salivary pump.
t = tentorium.
v = vertex.
vp = ventral plate.

EXPLANATION OF PLATES.

Plate I.

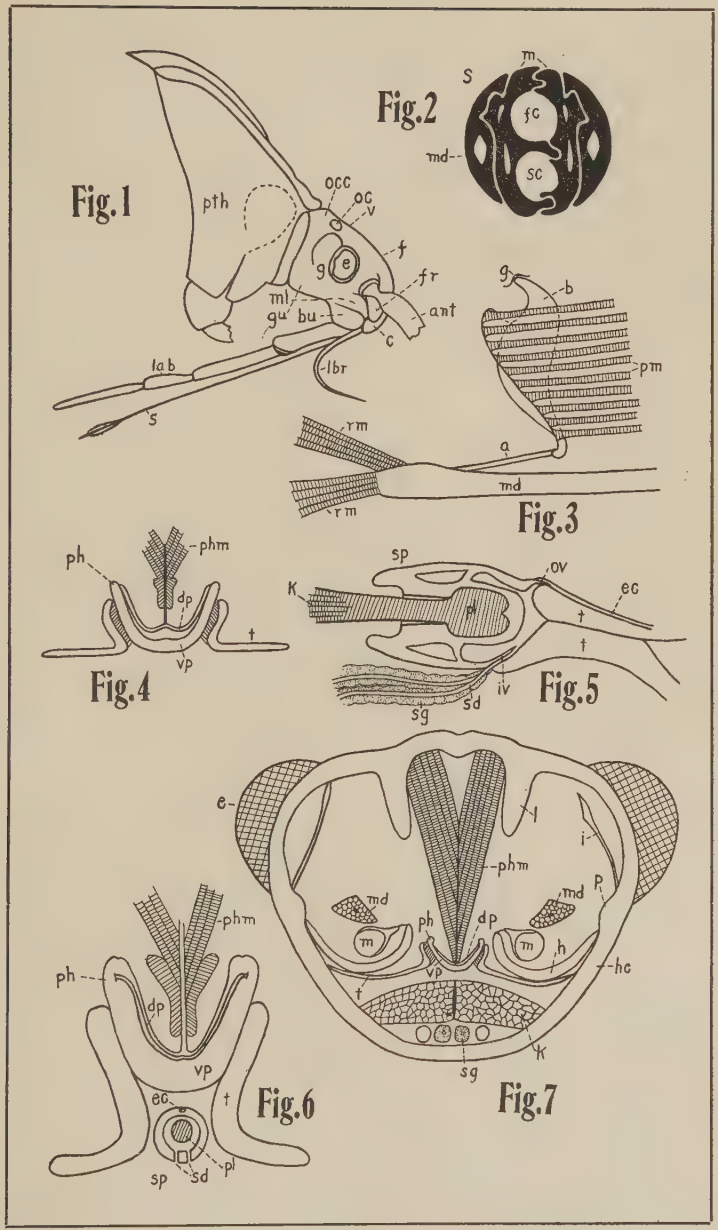
Fig. 1. Side view of head.
Fig. 2. Cross section of setæ.
Fig. 3. Mandibular seta showing its connection with the gena.
Fig. 4. Cross section through the middle region of the pharynx.
Fig. 5. Longitudinal section of salivary pump.
Fig. 6. Cross section of the pharynx and salivary pump as seen in fig. 10.
Fig. 7. Cross section through the eyes. A diagrammatic drawing of fig. 9.

Plate II.

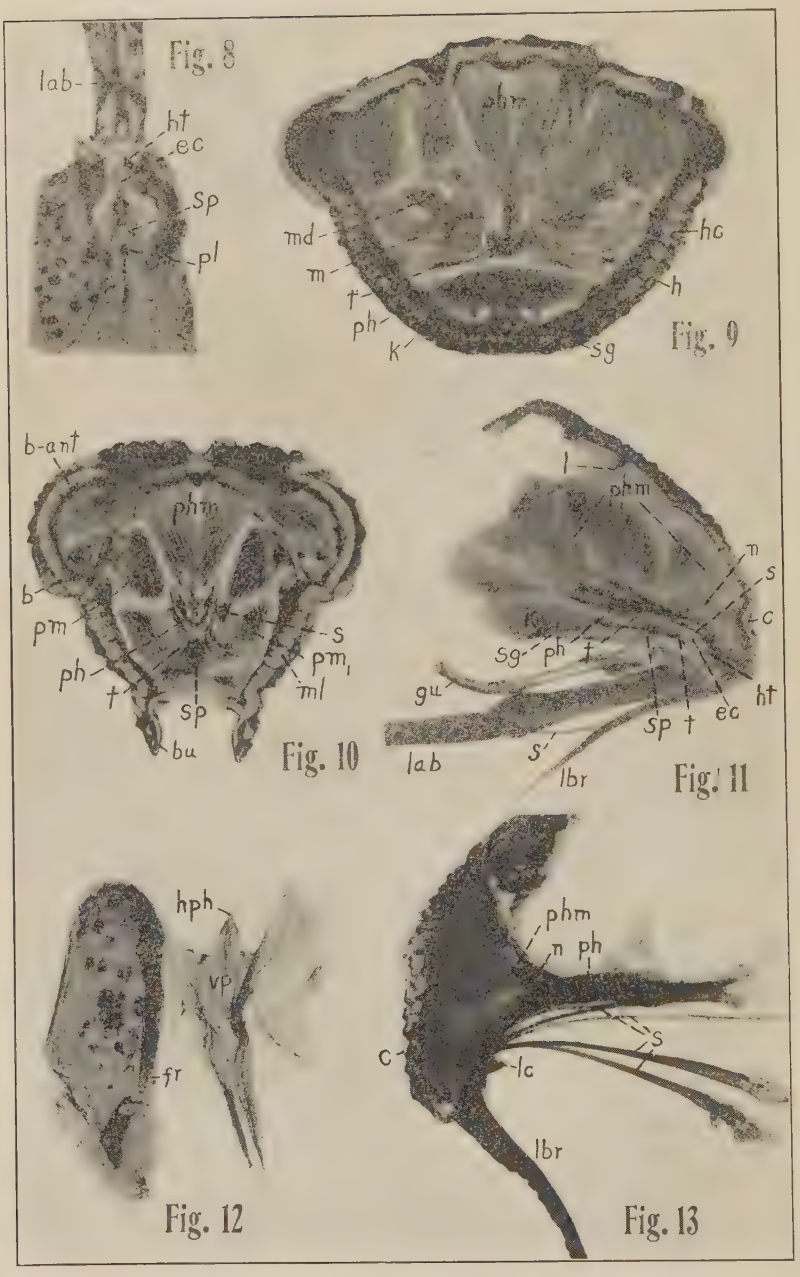
Figures 8–13 are microphotographs.

Fig. 8. Shows the salivary pump and efferent canal and the attachment of the labium. The horns of the tentorium are separated.
Fig. 9. Cross section of the head through the eyes.
Fig. 10. Cross section of the head through the bases of the antennæ.
Fig. 11. Longitudinal section of the head showing the pharyngeal muscles, pharynx and salivary pump, their supports, and the position of the setæ.
Fig. 12. Shows the ventral plate of the pharynx, and the hypopharynx, which are supported by the struts running to the fulcra.
Fig. 13. Shows the position of the pharynx and setæ at their junction, behind the lobes of the clypeus.

[1] The microphotographs were taken by T. W. Nicolet, from slider prepared by the author.



Tower—Mouth Parts of Squash Bug.



Tower—Mouth Parts of Squash Bug.

ADDITIONS TO THE GALL MIDGE FAUNA OF NEW ENGLAND.

By E. P. Felt,
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Last year we prepared a list[1] of 137 New England species, a number being characterized as new. Additional material has been received through the courtesy of Mr. C. W. Johnson of the Boston Society of Natural History, Mrs. A. T. Slosson of New York, and Miss Cora H. Clarke of Boston. Full data as to the origin of the material accompanies each description.

Mr. Johnson captured a specimen of *Asphondylia fulvopedalis* Felt at Brattleboro, Vt., August 15, 1908, adding thereby another species to the list.

Monardia lateralis sp. nov.

Male: Length .75 mm. Antennæ half the length of the body, thickly haired, dark brown; 13- and probably 14-segmented the fifth with a stem one-half the length of the tapering basal enlargement, which latter has a length nearly twice its diameter. Palpi; the first and second segments short, the third twice the length of the second. Mesonotum dark reddish brown. Scutellum, postscutellum and abdomen reddish brown. Halteres and legs mostly fuscous yellowish, the apical portion of the fourth and the fifth tarsal segments reddish brown. Claws strongly curved, finely denticulate, the pulvilli longer than the claws. Genitalia; basal clasp segment short, very broad, truncate distally; terminal clasp segment short, stout, broadly rounded apically and not reaching the median line. Harpes broad, irregular, heavily chitinized posteriorly, with the inner posterior angles produced in slightly curved, stout, conical processes extending in a postero-lateral direction.

Type: Cecid. 1511.

This species runs in our key to *M. balsamicola* Felt, from which it is easily separated by marked differences in the genitalia. It was received from C. W. Johnson, labeled Boston, Mass., May 10, Owen Bryant.

Monardia multiarticulata sp. nov.

Female: Length 3 mm. Antennæ extending to the third abdominal segment, thickly haired, yellowish brown, with 29 and possibly more antennal segments, the fifth subsessile, disk-like, with a length about three-fourths its diameter and exceptionally large, irregular stemmed disks. The terminal segments are produced, the stem with a length nearly two-thirds that of the broadly pyriform basal en-

[1] Psyche, Vol. XX, pp. 133–47.

largement. Palpi; the first segment subquadrate, the second with a length four times its diameter, the third a little longer than the second, the fourth a little longer than the third and somewhat dilated. Mesonotum black, sparsely clothed with ferruginous hairs. Scutellum dark brown, postscutellum fuscous. Abdomen brownish yellow, the ovipositor fuscous. Halteres and legs mostly fuscous yellowish, the distal tarsal segment slightly fuscous; claws denticulate, the pulvilli rudimentary. Ovipositor short, the lobes triarticulate, the distal segments suborbicular and rather thickly clothed with long, stout setæ.

Type: Cecid. 1501.

This species is described from a very interesting midge received from Mrs. A. T. Slosson and labeled Franconia, N. H. It is remarkable because of the very large number of antennal segments. This and other characters prevent our referring it to two allied forms, namely *C. lignivora* Felt and *C. articulosa* Felt.

Monardia rugosa sp. nov.

Female: Length 2 mm. Antennæ extending to the third abdominal segment, thickly haired, light brown; 12 segments, the fifth with a stem three-fourths the length of the tapering basal enlargement, which latter has a length one-third greater than its diameter, bears conspicuous disk-like organs near the middle and is conspicuously wrinkled apically; terminal segment produced, with a length fully twice its diameter, the distal half more slender, coarsely and reticulately wrinkled, and with a short, tapering asymmetrical process apically. Palpi; first segment subquadrate, the second ovate, the third smaller, globose, the fourth more than twice the length of the third and slender. Mesonotum reddish brown. Scutellum light purplish brown, postscutellum, abdomen, coxæ and legs mostly fuscous yellowish. Claws rather stout, evenly curved, the pulvilli rudimentary. Submedian ventral glands of the sixth abdominal segment oval. Ovipositor short, triarticulate, the terminal lobes tapering to a narrowly rounded setose apex.

Type: Cecid. 1510.

This midge was received from C. W. Johnson and labeled Hanover, N. H., August 5, 1908. It is easily separated from females previously referred to this species, by the distinct stems of the antennal segments.

Porricondyla novae-angliae sp. nov.

Female: Length 1.75 mm. Antennæ extending to the third abdominal segment, sparsely haired, dark brown, probably 12 and possibly 14 segments, the fifth with a stem one-fourth the length of the cylindrical basal enlargement, which latter has a length three times its diameter; terminal segment missing. Palpi; the first segment stout, with a length three times its diameter, the second one-half longer, more slender, the third a little longer than the second, somewhat dilated, and the fourth one-half longer than the third. Mesonotum shining dark brown. Scutellum red-

dish brown, postscutellum dark brown. Abdomen dark yellowish brown. Halteres yellowish basally, fuscous apically. Coxæ and femora basally yellowish, the distal portion of femora and the tibiæ mostly dark straw. Tarsi yellowish brown, the posterior pair with the distal portion of the second and the third, fourth and fifth segments whitish. Ovipositor short, the terminal lobes biarticulate, the basal portion narrowly oval, the distal segment fusiform and sparsely setose.

Type: Cecid. 1503.

The midge was received from Mrs. A. T. Slosson and was labeled Franconia, N. H. The structure of the ovipositor serves to separate it at once from all other females referable to this genus.

Porricondyla papillata sp. nov.

Female: Length 3 mm. Antennæ extending to the fourth abdominal segment, ratherly thickly haired, yellowish, the distal segments brownish; 14 segments, the fifth with a short stem, the cylindrical basal enlargement with a length about three times its diameter. Palpi; the first segment long, with a length four times its diameter, the second short, irregular, the third nearly twice the length of the second, the fourth slender and fully twice the length of the third. Mesonotum reddish brown. Scutellum brownish yellow, postscutellum a little darker. Abdomen sparsely haired, yellowish brown. Halteres brownish yellow. Coxæ and femora mostly pale straw. Tibiæ a little darker, the tarsi yellowish brown. Claws stout, strongly curved, unidentate, the pulvilli longer than the claws. Ovipositor short, indistinct in the preparation, apparently being covered by two rounded lateral plates, each with a large, thick group of papillæ sublaterally; each papilla subconical, hirsute and apically with a falcate process.

Type: Cecid. 1502.

The midge characterized above was received from Mrs. A. T. Slosson and labeled Mount Washington. It is a large form easily separated from all other midges known to us, by the two large sublateral groups of papillæ at the posterior extremity.

Lasiopteryx crispata sp. nov.

Larva: Length 2.5 mm., moderately stout, yellowish orange. Head rather narrowly triangular, apex narrowly rounded. Antennæ biarticulate, tapering, with a length about three times the diameter; breastbone well chitinized, bidentate, the shaft tapering posteriorly and somewhat expanded at its extremity. Skin coarsely shagreened, posterior extremity broadly rounded, slightly bilobed.

Female: Length 1 mm. Antennæ one-half the length of the body, sparsely haired, fuscous, the two basal segments yellowish; 13 and probably 14 subsessile segments, the fifth cylindric, with a length about $2\frac{1}{2}$ times its diameter and with a moderately thick subapical group of long, curved setæ near the ventral third. Palpi; first segment irregular, the second with a length three times its diameter, the third and

fourth, each as long as the second and successively more slender. Face pale yellowish; eyes black. Body yellowish. Mesonotum fuscous, the submedian lines with broad, rather coarse scalelike hairs. Abdomen clothed with fuscous scales and a few long hairs, the incisures yellowish. Wings hyaline, the membrane with numerous narrow, curved scales; costa dark brown. Halteres black. Coxæ yellowish; femora basally pale yellowish, the tibiæ and tarsi gradually darker to dark brown. Claws slender, strongly curved, unidentate, the pulvilli about half the length of the claws. Ovipositor short, the lobes narrowly oval and thickly setose.

Type: Cecid. a2341.

A single female was reared August 22, 1912, from a jar containing oval, yellowish blister galls on *Oakesia sessilifolia* collected by Miss Cora H. Clarke at Magnolia, Mass. It is possible that this insect was not an inhabitant of this gall. The generic reference is also provisional.

Schizomyia speciosa sp. nov.

Female: Length 2 mm. Antennæ as long as the body, thickly haired, reddish brown, the segments distally with yellowish hairs, these producing an indistinct yellowish annulation; 14 segments, the fifth with a length about five times its diameter, the 12th with a length one-half greater than its diameter, the 13th with a length equal its diameter, the 14th disk-like. Palpi; first segment irregular, the second with a length about three times its diameter, the third with a length four times its diameter, somewhat dilated, the fourth one-half longer than the third and dilated. Mesonotum yellowish brown, the submedian lines thickly clothed with long, yellowish hairs. Scutellum and postscutellum yellowish. Abdomen sparsely haired, dark brown. Wing membrane thickly clothed with dark scales, almost subhyaline, there being a distinct spot near the tip of the third vein, one at the apex of the fifth and another along its posterior fork. Halteres dark brown, the distal portion of the stem yellowish, the apical half of the club white. Coxæ yellowish brown. Legs mostly dark brown, the anterior and middle femora narrowly annulate in the middle with yellowish, the posterior femora with the basal half white; the bases of the tibiæ, the first tarsal segment and the distal half of the second, third and fourth and the basal portion of the fifth white. The bands on the posterior tarsi yellowish and broader, there being on the third and fourth tarsal segments only a narrow, brown annulation near the basal third. Claws moderately stout, evenly curved, simple, the pulvilli rudimentary. Ovipositor when extended probably as long as the body, the aciculate part narrowly chitinized ventrally and approaching the condition found in Asphondylia; the ventral plate well developed.

Type: Cecid. 1507.

The striking midge described above was received from Mrs. A. T. Slosson and labeled Franconia, N. H. It is allied to *S. rivinæ* Felt from which it may be easily separated by its somewhat larger

size, the darker color of the abdomen, the more distinctly and broadly white-banded posterior tarsi and the relatively longer antennal segments.

Hormomyia proteana sp. nov.

Male: Length 5 mm. Antennæ extending to the third abdominal segment, sparsely haired, fuscous yellowish; 14 segments, the fifth subsessile, subcylindric, with a broad constriction at the basal third; the eighth and following rather plainly binodose, with stems about three-fourths and one-half their diameters, respectively. The three circumfili irregular and apparently forming double or nearly double bands. Terminal segment with a narrow constriction dividing the globose basal enlargement and the fusiform distal swelling. Palpi probably small (indistinct in the preparation) and presumably uni- or biarticulate. Mesonotum shining black. Scutellum and the lateral and posterior margins of the thorax yellowish, the postscutellum dark brown. Abdomen mostly yellowish brown. Halteres yellowish. Coxæ and legs fuscous yellowish; claws simple, the pulvilli rudimentary. Genitalia; basal clasp segment long, moderately stout; terminal clasp segment long, stout; dorsal plate broadly, deeply and triangularly emarginate, the lobes moderately slender and narrowly rounded apically; ventral plate moderately long, broad, broadly rounded.

Type: Cecid. 1521.

The large midge described above was collected by Mr. C. W Johnson at Auburndale, Mass., May 28. It is easily distinguished from other large Hormomyias by the antennal segments and particularly by the cylindric character of the basal ones of the flagellum.

Parallelodiplosis cinctipes sp. nov.

Male: Length 1 mm. Antennæ one-half longer than the body, thickly haired, pale straw; 14 segments, the fifth with stems 2 and 2½ times their diameters, respectively. Circumfili moderately long. Palpi; first segment short, broadly oval, the second quadrate, with a length more than twice its width, the third a little shorter and more slender than the second, the fourth one-half longer than the third, dilated. Mesonotum yellowish brown. Scutellum yellowish, postscutellum and abdomen yellowish brown. Wings subhyaline, with indistinct fuscous areas near the distal fourth, before and behind the third vein, near the middle, on the margin between the third and fifth veins, and on the fork of the fifth and at the basal third an indistinct diffused area extending nearly across the wing. Halteres yellowish transparent. Legs dark brown, broadly banded with white as follows: Femora, the apical half; tibiæ, a broad band near the basal third and the apical half; tarsi, the apex of the first segment and the basal two thirds of the second, the basal two thirds of the third and most of the fourth and fifth, the banding being more striking on the posterior than on the anterior or mid legs. Genitalia; basal clasp segment moderately long, stout, with a distinct tooth at the internal basal

angle; terminal clasp segment long, rather stout; dorsal plate broad, deeply and roundly emarginate, the lobes narrowly rounded; ventral plate moderately long, broad, narrowly rounded apically; style long, the basal two thirds swollen, the apex dilated.

Type: Cecid. 1522.

The well marked midge described above was reared in May, 1908, by Mr. C. A. Frost, Framingham, Mass., from dead twigs of *Rhus vernix*. The specimens were placed at our disposal through the courtesy of Mr. C. W. Johnson.

EXCHANGE COLUMN.

Will name and return species in certain families of Coleoptera. Buprestidæ especially desired.—C. A. Frost, 26 Pond Street, South Framingham, Mass.

Wanted. Insects from ant-nests, with specimens of the ants, from any part of the world. Will give Coleoptera, Diptera and Hymenoptera from any Western United States.—W. M. Mann, Bussey Institution, Forest Hills, Mass.

Will exchange for Geometridæ from any section of North America, or identify material for privilege of retaining examples.—L. W. Swett, 501 Washington Street, Room 44, Boston, Mass.

Will exchange insects of various orders for Parasitic Hymenoptera from any part of the world.—C. T. Brues, Bussey Institution, Forest Hills, Mass.

Wanted, for cash or exchange, living material of Lucilia from the Southern States; also living material of *Cynomia mortuorum* from Europe and any other species of Cynomia except *Cadaverina*. Will give directions for shipment.—P. W. Whiting, Bussey Institution, Forest Hills, Mass.

Carabus chamissonis and other rare Coleoptera for Dytisidæ not in my collection. —F. W. Dodge, Melrose Highlands, Mass.

Wanted. Ants from all parts of the world.—W. M. Wheeler, Bussey Institution, Forest Hills, Mass.

I pay cash or give American and exotic insects in exchange for fertile eggs of Catocala spp., *living* Catocla ♀ ♀ (captured specimens only), hibernating pupæ and larvæ of any other group of Lepidoptera.—William Reiff, 366 Arborway, Jamaica Plain, Boston, Mass.

Florida insects of all orders, also Fish, Batrachians, Reptiles, Shells and Marine Invertebrates sold by A. G. Reynolds, Gulfport, Florida.

New England Orthoptera identified. I wish to examine adult orthoptera of all families from all parts of New England. Material will be identified for the privilege of retaining desired examples, for which good exchanges will be given, subject to approval of owner.—A. P. Morse, Wellesley College, Wellesley, Mass.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect: many others.—J. E. Hallinen, Cooperton, Okla.